OFFICE

DU MONT

TIME CALIBRATOR

TYPE 300

300

Allen B. Du Mont Laboratories, Inc.

INSTRUMENT DIVISION

760 BLOOMFIELD AVENUE, CLIFTON, N. J., U. S. A.

Obviously, the design of any scientific instrument results from a series of compromises which represent the designer's opinion of an ideal instrument consistent with contemporary engineering techniques and present-day production possibilities.

In developing this instrument, an attempt has been made to incorporate those characteristics which, we believe, will satisfy the greatest number of applications.

We feel, however, that the real test of any instrument is the opinion of the man who uses it. This day-to-day test of the instrument's advantages and limitations will prove, more than any other method, just what characteristics are desirable.

Because of the nature of the equipment manufactured by Allen B. Du Mont Laboratories, Inc., it is only by complete cooperation between the customer and our Engineering Department that satisfactory designs can be achieved. In a continuous attempt to increase the applicability of our equipment to the problems of the engineer, we sincerely request suggestions advising in what manner the design of this equipment may be further extended to include these problems.

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ALLEN B. DU MONT LABORATORIES, INC.
INSTRUMENT DIVISION
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DU MONT TYPE 300 TIME CALIBRATOR

section 1
technical summary

The Du Mont Type 300 Time Calibrator is a compact, portable instrument that provides crystal-controlled, precise timing markers and synchronizing signals.

This instrument provides a 10 mc (0.1 μs) sine wave output, and sharply peaked pulses with periods of 1, 10, 100, 1K, and 10K microseconds, all accurate within ±0.1%. In addition, a pulse shaper circuit is included which transforms externally applied signals of 5 volts rms minimum and between 100 cps and 1 mc into sharp pulses of the same frequency.

The amplitude of the LO calibrating signals is 3 volts peak-to-peak minimum (measured at the end of a five-foot length of RG-62/U cable terminated in 93 ohms). By rotating the OUTPUT SELECTOR switch to HI, signals of −15 volts peak-to-peak (excluding the 0.1 μs output) can be obtained at the end of the cable using a 100K ohm termination.

Positive synchronizing signals of 100 cps, 1, 10, 100 kc are available from front-panel terminals for application to the external sync terminal of an oscillograph or synchronization of other external equipment.

The over-all dimensions of the unit are 7-1/2″ x 5-1/2″ x 11″ and the weight is 7-1/2 pounds. The instrument operates from a primary power source of 115 volts ± 10%, 50-400 cps, and dissipates approximately 50 watts. Additional electrical characteristics of the Type 300 are listed in Table 1-1, Technical Summary Sheet, which follows:

TABLE 1-1
TECHNICAL SUMMARY SHEET

GENERAL INFORMATION

Name and Designation of Unit.....Du Mont Type 300 Time Calibrator

CALIBRATING SIGNAL DATA

Output Signals

Shape	*Period*	*Pulse Width μs*
sine wave	0.1 μs	
pulse	1.0 μs	0.08 ±20%
pulse	10 μs	0.08 ±20%
pulse	100 μs	3.5 ±20%
pulse	1K μs	3.5 ±20%
pulse	10K μs	3.5 ±20%

Pulse Rise Time.....0.05 microseconds maximum

Accuracy 0.1%

Availability .....Front-panel OUTPUT terminal (UG-625/U)

Output Amplitude

OUTPUT SELECTOR at LO.....Minimum: +3 volts peak-to-peak (thru 5 ft. of RG-62/U cable terminated by 93 ohms)

OUTPUT SELECTOR at HI .....Minimum: −15 volts peak-to-peak (thru 5 ft. of RG-62/U cable terminated by 100K ohms)

SYNC DATA

Output .....Sync signals of 100 cps, 1 kc, 10 kc and 100 kc available at POS SYNC OUTPUT terminals at all positions of the PERIOD switch. For the 0.1μs position only, sync rate is controlled by the 0.1 MICROSECOND SYNC within ±5%

Amplitude .....Minimum: +3 volts peak (external termination is 10K or greater)

Duration .....Approximately 0.2 microsecond (50% points)

Rise Time .....Approximately 0.1 microsecond

PULSE SHAPER (PERIOD switch set to PULSE SHAPER)

Input Signal

Sine wave .....5 volts rms; 100 cps to 1 mc

Positive pulse .....3 volts peak; 100 cps to 1 mc

Output Signal

Wave shape .....Sharp output pulses of the Schmitt-trigger type
Pulse width: 0.08 μs ± 20%
Amplitude: 3 V p-p (terminated in 93 ohms)

POWER SUPPLY

Primary-power Potential .....115 volts ±10%

Primary-power Frequency .....50-400 cycles

Primary Power .....Approximately 50 watts

Fuse Protection .....1 ampere

PHYSICAL CHARACTERISTICS

Height .....7-1/2 inches

Width .....5-1/2 inches

Depth .....11 inches

Weight .....7-1/2 pounds

TUBE COMPLEMENT

1-OA2	1-6X4
1-6AH6	2-12AT7
	3-12AU7

section 2
operation

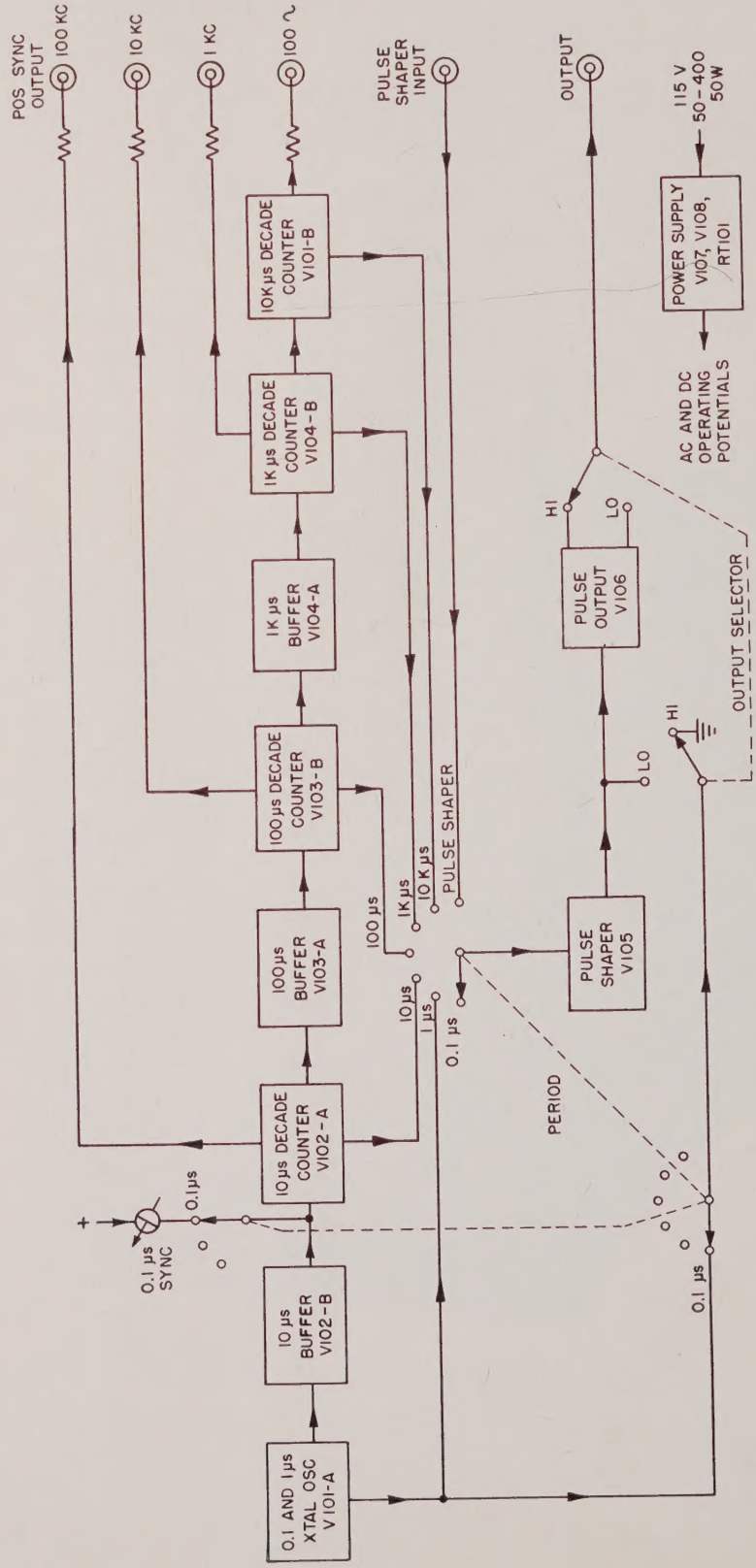


FIGURE 1-1. OVER-ALL BLOCK DIAGRAM, TYPE 300 TIME CALIBRATOR

section 2
operation

1. UNPACKING AND INSPECTION

The Du Mont Type 300 Time Calibrator is shipped with all tubes in place and ready to operate. Upon receipt, and prior to operation, the instrument should be inspected for any damage incurred in shipment. To gain access to the chassis, remove the two screws from the rear of the instrument and slide the chassis forward.

2. LOCATION AND INSTALLATION

Since the Type 300 is portable, no special installation procedure is required. However, it should be located as close as possible to the instrument to be calibrated, thus, maintaining short signal leads and minimizing stray pickup and loading.

3. ENERGIZING THE EQUIPMENT

To place the Type 300 in operation, plug the power cord into a 115-volt, 50-400 cycle line outlet and throw the front-panel toggle switch to the POWER position. Allow approximately five minutes for the instrument to warm-up. To eliminate shock hazard, ground the unit (a pigtail is provided on the line cord plug for this purpose).

4. FRONT-PANEL FACILITIES

The front-panel controls of the Type 300 are identified in Figure 2-1. The markings on the front panel are essentially self explanatory, and after carefully studying Table 2-1, which list the functions of the various controls and terminals, the operator should find it possible to master the controls with a minimum of experimentation. Detailed instructions on the operation of the controls to make use of all the features of the instrument are given in subsequent paragraphs.

5. OPERATING HINTS

a. CHECKING CALIBRATION

To check the calibration of the Type 300, refer to the instruction plate located on right side of the cabinet. Additional information will be found in Section IV, Maintenance.

b. OUTPUT CALIBRATION SIGNALS

Pulse repetition periods of 1 μs, 10 μs, 100 μs, 1K μs, or 10K μs are available singly at the OUTPUT terminal as selected by the PERIOD switch. A sine wave repetition period of 0.1 μs is also available. These signals are suitable for all applications in the oscillographic field that require accurate time calibration.

c. PULSE SHAPING

Continuously variable pulse repetition frequencies between 100 cps and 1 mc may be obtained as follows: Set PERIOD switch to PULSE SHAPER. Apply a sine wave signal of at least 5 volts rms and of the desired frequency to the PULSE SHAPER INPUT terminal. These externally applied signals will be transformed into sharp pulses having the same frequency or repetition rate. The POS SYNC OUTPUT signals are still available when the unit is operated in this manner.

At low repetition rates difficulty may be had in viewing the pulses on a CRT screen. It may be necessary to stretch the output pulse by adding capacitance to the OUTPUT terminal. With 0.001 μf of capacity, the pulse width will be increased approximately ten times with a consequent decrease in amplitude. Additional capacity can be added for additional stretching if further amplitude loss can be tolerated.

TABLE 2-1. FRONT-PANEL FACILITIES

NAME	FUNCTION
PERIOD 0.1 MICROSECOND SYNC	Concentric controls: Outer knob—PERIOD—selects singly in decade steps pulse periods in microseconds (1 μs, 10 μs, 100 μs, 1Kμs, 10Kμs), or sine wave repetition rate (0.1 μs). PULSE SHAPER position connects externally applied signal to pulse shaping circuit. Inner knob—0.1 MICROSECOND SYNC—controls POS SYNC OUTPUT rates when PERIOD switch is set to 0.1 μs.
POWER-OFF	Toggle switch: applies primary power to the power supply circuits.
OUTPUT	Coaxial terminal: supplies calibrating signals of 3 volts peak-to-peak when OUTPUT SELECTOR (side-panel location) is set at LO; when this control is set at HI, supplies negative pulses of 15 volts peak-to-peak (excluding the 0.1 μs output).
POS SYNC OUTPUT	Four binding posts: provide synchronizing signals of 100 cps, 1 KC, 10 KC and 100 KC at any position of the PERIOD switch.
PULSE SHAPER INPUT 5V RMS MIN 100~TO 1MC	Two binding posts: provides for connection of external signals to the shaper circuit when PERIOD switch is set to PULSE SHAPER.

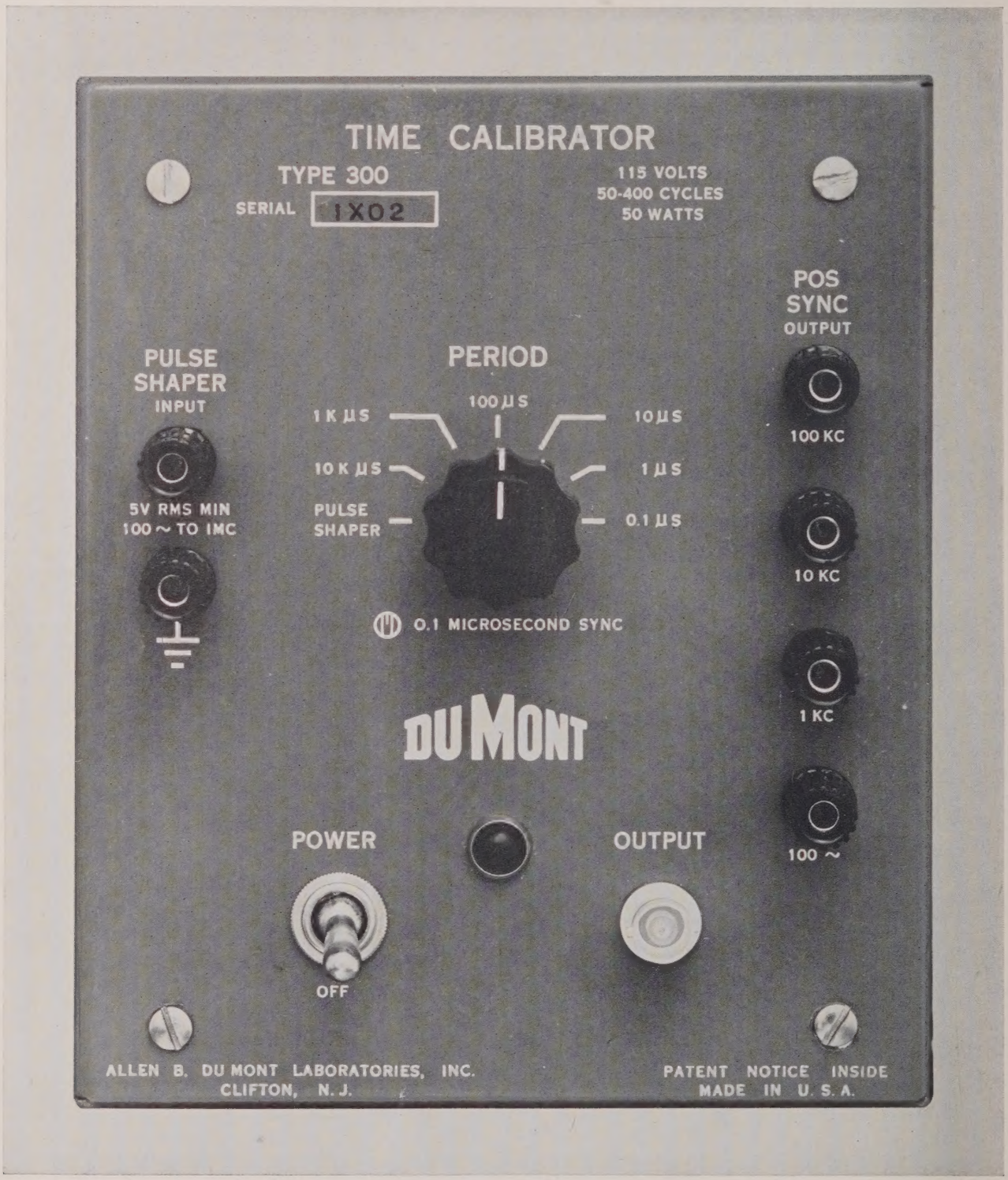


FIGURE 2-1. FRONT-PANEL FACILITIES

d. OUTPUT SELECTOR SWITCH

For normal operation, the OUTPUT SELECTOR (located on left side) is set to the LO position. The amplitude of the HI or LO OUTPUT calibration signal may be varied by the side-panel (left) AMPL ADJ, if desired. With the OUTPUT SELECTOR switch in the HI position, the amplitude of the negative OUTPUT pulses (excluding the 0.1 μs output) is suitable for application as intensity markers.

NOTE

WHEN THE PERIOD SWITCH IS SET TO 0.1 μs, THE OUTPUT SELECTOR SWITCH MUST BE IN THE LOW POSITION TO OBTAIN THE 0.1 μs OUTPUT.

e. POS SYNC OUTPUT TERMINALS

To overcome any possible problems caused by limited duty cycle or lockout of an oscillograph sweep, four POS SYNC OUTPUT terminals are provided. These terminals provide synchronizing signals of 100~, 1 kc, 10 kc and 100 kc for application to the external sync terminals of a cathode-ray oscillograph, or for synchronization of other external equipment. When the PERIOD switch is set at 0.1 μs, the 0.1 MICROSECOND SYNC control is connected into the 10 μs counter circuit. Adjustment of this vernier control locks the 10 μs decade counter with the 0.1 μs calibrating signal in order to produce stable sync operation.

f. APPLICATIONS

The possible uses of the Du Mont Type 300 Time Calibrator are varied and many.

The calibrator is very useful for checking CRO sweep linearity, for accurate calibration of sweeps, and for superposition of timing markers on the trace when making permanent photographic recordings.

Signal generators and other instruments producing repetitive phenomena can be quickly calibrated by a comparison of their output with the Type 300 output on an oscillograph. Decade-frequency-range switches can be quickly and accurately checked in a similar manner.

section 3
theory of operation

1. GENERAL

The Du Mont Type 300 Crystal Controlled Time Calibrator is a portable instrument which produces stable positive output signals for use as accurate calibration markers. Available pulses have repetition periods of 1 μs, 10 μs, 100 μs, 1K μs, and 10K μs, accurate within 0.1%. A 10-mc sine wave provides the 0.1 μs calibrating signal.

An over-all block diagram of the Type 300 is shown in Figure 1-1.

2. CIRCUIT DESCRIPTION

a. CRYSTAL CONTROLLED OSCILLATOR

V101-A is connected as a modified Pierce-type crystal oscillator which produces outputs of 10 mc and 1 mc.

When the PERIOD switch is set to 0.1 μs, the 10-mc crystal, the 0.1 MICROSECOND SYNC and the 10-mc shunt load (L102 and C108) are switched in the circuitry of V101-A. The 10-mc output is coupled directly to the output stage (V106), without pulse shaping, and is available at the OUTPUT terminal only when the OUTPUT SELECTOR (S103) is in the LO position.

When the PERIOD switch is set to 1 μs, the 1 mc crystal is switched in, and L102 and C108 removed from the circuit. The 1 mc output from the cathode is coupled to the pulse shaping circuit for formation of 0.1 μs calibrating signals. Both HI and LO outputs are available at the OUTPUT terminal.

b. DECADE COUNTERS AND BUFFERS

The output from the crystal-controlled oscillator (V101-A) is always coupled to the 10 μs cathode-follower buffer (V102-B). The 10 μs ADJ (C105) or the 0.1 MICROSECOND SYNC (R105) is adjusted such that stage V102-A oscillates at 1/10 or 1/100 the synchronizing frequency (1 mc or 10 mc). The output of V102-A is therefore always 100 kc (10 μs). The other decade counters operate in similar manner, each counting down by a factor of 10 and obtaining its synchronizing signal from the preceding stage. The time constants for these counters are adjusted by variable grid resistors or an adjustable trimmer capacitor.

The PERIOD switch selectively picks off the outputs from the cathodes of the decade counter tubes and couples them to a pulse forming Schmitt-trigger circuit.

Synchronizing signals of 100~, 1 kc, 10 kc, and 100 kc are available at the POS SYNC OUTPUT terminal at all positions of the PERIOD switch.

c. PULSE SHAPER

The pulse-shaper stage incorporates the Schmitt-trigger principle. It utilizes a one-shot multivibrator (V105-A and V105-B) with provisions for switching plate loads. In the 1 μs and 10 μs positions, the plate load consists of the "shocking coil" (L103) and crystal (CR103). CR103 clips the negative-going signal, with the result that sharp positive pulses, suitable for calibration markers, are produced. In the 100 μs, 1K μs, and 10K μs positions, the 1K resistive plate load is switched into the circuit. This is done to produce wider output pulses at the lower repetition rates to facilitate proper calibration of the cathode-ray oscillograph.

When the PERIOD switch is set to PULSE SHAPER, stage V105 is disconnected from the counter circuits and connected to the PULSE SHAPER INPUT terminal. Hence, external signals applied to this terminal will be "shaped" and have the same frequency output as the input signal.

d. PULSE OUTPUT STAGE

Stage V106 serves as a dual output stage: When the OUTPUT SELECTOR switch is set to HI, this stage is an anode amplifier; at LO, this stage is a cathode follower.

3. POWER SUPPLY CIRCUITRY

V107 is connected as a full-wave rectifier for the B+ supplies. After filtering, voltages of +225, +175, and (after regulation by V108) +150 are obtained.

Heater regulation for V101, V102, V103-B, and V104-B is provided by RT101.

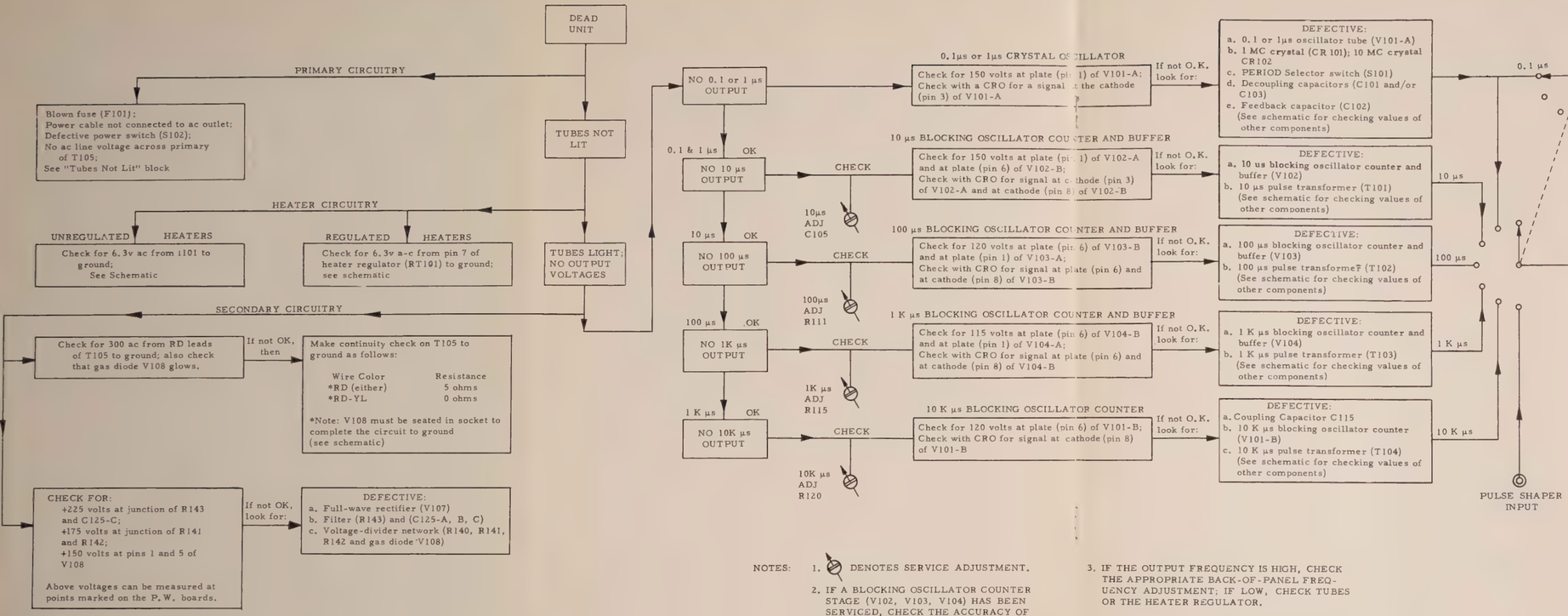

DEAD UNIT
PRIMARY CIRCUITRY
Blown fuse (F101);
Power cable not connected to ac outlet;
Defective power switch (S102);
No ac line voltage across primary of T105;
See "Tubes Not Lit" block
TUBES NOT LIT
HEATER CIRCUITRY
UNREGULATED HEATERS
Check for 6.3v ac from 1101 to ground;
See Schematic
REGULATED HEATERS
Check for 6.3v a-c from pin 7 of heater regulator (RT101) to ground; see schematic
TUBES LIGHT; NO OUTPUT VOLTAGES
SECONDARY CIRCUITRY
Check for 300 ac from RD leads of T105 to ground; also check that gas diode V108 glows.
If not OK, then
Make continuity check on T105 to ground as follows:
Wire Color Resistance
*RD (either) 5 ohms
*RD-YL 0 ohms
*Note: V108 must be seated in socket to complete the circuit to ground (see schematic)
CHECK FOR:
+225 volts at junction of R143 and C125-C;
+175 volts at junction of R141 and R142;
+150 volts at pins 1 and 5 of V108
Above voltages can be measured at points marked on the P.W. boards.
If not OK, look for:
DEFECTIVE:
a. Full-wave rectifier (V107)
b. Filter (R143) and (C125-A, B, C)
c. Voltage-divider network (R140, R141, R142 and gas diode V108)
NO 0.1 or 1 µs OUTPUT
0.1 & 1 µs OK
NO 10 µs OUTPUT
CHECK
10µs ADJ C105
10 µs OK
NO 100 µs OUTPUT
100µs ADJ R111
100 µs OK
NO 1K µs OUTPUT
1K µs ADJ R115
1 K µs OK
NO 10K µs OUTPUT
10K µs ADJ R120
0.1µs or 1µs CRYSTAL OSCILLATOR
Check for 150 volts at plate (pin 1) of V101-A;
Check with a CRO for a signal at the cathode (pin 3) of V101-A
If not O.K. look for:
DEFECTIVE:
a. 0.1 or 1µs oscillator tube (V101-A)
b. 1 MC crystal (CR 101); 10 MC crystal CR102
c. PERIOD Selector switch (S101)
d. Decoupling capacitors (C101 and/or C103)
e. Feedback capacitor (C102)
(See schematic for checking values of other components)
10 µs BLOCKING OSCILLATOR COUNTER AND BUFFER
Check for 150 volts at plate (pin 1) of V102-A and at plate (pin 6) of V102-B;
Check with CRO for signal at cathode (pin 3) of V102-A and at cathode (pin 8) of V102-B
If not O.K. look for:
DEFECTIVE:
a. 10 us blocking oscillator counter and buffer (V102)
b. 10 µs pulse transformer (T101)
(See schematic for checking values of other components)
100 µs BLOCKING OSCILLATOR COUNTER AND BUFFER
Check for 120 volts at plate (pin 6) of V103-B and at plate (pin 1) of V103-A;
Check with CRO for signal at plate (pin 6) and at cathode (pin 8) of V103-B
If not O.K. look for:
DEFECTIVE:
a. 100 µs blocking oscillator counter and buffer (V103)
b. 100 µs pulse transformer (T102)
(See schematic for checking values of other components)
1 K µs BLOCKING OSCILLATOR COUNTER AND BUFFER
Check for 115 volts at plate (pin 6) of V104-B and at plate (pin 1) of V104-A;
Check with CRO for signal at plate (pin 6) and at cathode (pin 8) of V104-B
If not O.K. look for:
DEFECTIVE:
a. 1 K µs blocking oscillator counter and buffer (V104)
b. 1 K µs pulse transformer (T103)
(See schematic for checking values of other components)
10 K µs BLOCKING OSCILLATOR COUNTER
Check for 120 volts at plate (pin 6) of V101-B;
Check with CRO for signal at cathode (pin 8) of V101-B
If not O.K. look for:
DEFECTIVE:
a. Coupling Capacitor C115
b. 10 K µs blocking oscillator counter (V101-B)
c. 10 K µs pulse transformer (T104)
(See schematic for checking values of other components)
0.1 µs
10 µs
100 µs
1 K µs
10 K µs
PERIOD
PULSE SHAPER INPUT
NOTES:
1. DENOTES SERVICE ADJUSTMENT.
2. IF A BLOCKING OSCILLATOR COUNTER STAGE (V102, V103, V104) HAS BEEN SERVICED, CHECK THE ACCURACY OF THE REMAINING COUNTERS AND ADJUST IF NECESSARY. (SEE SECTION IV PARAGRAPH 3 FOR PROCEDURE)
3. IF THE OUTPUT FREQUENCY IS HIGH, CHECK THE APPROPRIATE BACK-OF-PANEL FREQUENCY ADJUSTMENT; IF LOW, CHECK TUBES OR THE HEATER REGULATOR.
PULSE SHAPER
Check for 170 volts at plate (pin 1) and 175 volts at plate (pin 6) of V105;
Check with CRO for signal at gnd. (pin 5) and at plate (pin 6) of V105
Check setting of STAB ADJ (R129)
If not O.K. look for
CHECK STAB ADJ R129
PULSE OUTPUT STAGE
Check for 225 volts at plate (pin 5) of V106
Check with CRO for signal at plate (pin 5) and cathode (pin 7) of V106. Check for signal at OUTPUT jack (J107)
If not O.K. look for:
DEFECTIVE:
a. Pulse output stage (V106
b. Coupling capacitors (C121, C122, C123)
c. OUTPUT Selector switch (S103)
(See schematic for checking values of other components)
OUTPUT SELECTOR
HI
LO
OUTPUT J107
CHECK AMPL ADJ R139

FIGURE 4-3. TROUBLE SHOOTING DIAGRAM.

FIGURE 4-3. TROUBLE SHOOTING DIAGRAM.

section 4
maintenance

1. GENERAL

Removal of the two screws at the rear of the cabinet allows the chassis to be withdrawn for maintenance.

CAUTION

OBSERVE THE FOLLOWING PRECAUTIONS WHEN NECESSARY TO ENERGIZE THE EQUIPMENT WITH THE CABINET REMOVED.

(1) Never work alone.

(2) Make sure the chassis is properly grounded.

(3) Turn off power before changing any tubes.

(4) Before touching any component, short the terminals to remove any possible charge that may remain after turning off the power.

The first step in correcting any trouble or failure that may occur is to isolate the section of the circuit causing the trouble. Such isolation can be accomplished by considering the circuit as composed of the basic sections shown in the over-all block diagram, Figure 1-1.

The next step after isolating the trouble to a particular section is to determine the specific tube circuit involved. A replacement tube should be tried before attempting any other tests. NOTE: *Replacement of certain tubes will require resetting of one or more service adjustments. Consult Trouble Shooting Chart, Figure 4-3 for instructions.* If trouble persists, voltage and resistance measurements should be made, and waveforms should be observed at critical points in the circuit using a cathode-ray oscillograph.

2. MAINTENANCE REFERENCE DATA

a. OVER-ALL SCHEMATIC

An over-all schematic of the circuits will be found at the back of this section and should be consulted while trouble shooting. A list of the component electrical parts, including descriptions, is also provided.

b. TROUBLE SHOOTING CHART

As an aid in servicing, Trouble Shooting Chart, Figure 4-3, indicates symptoms, probable causes of trouble and remedies.

c. WAVEFORM DATA

Checking with a cathode-ray oscillograph for the presence of the correct waveform at critical points in the circuit aids greatly in the diagnosis of component or circuit failure. Sketches of waveforms are shown on the over-all schematic diagram at the exact point at which they occur. In addition, the approximate peak-to-peak voltage amplitude of each waveform is given.

d. VOLTAGE AND RESISTANCE MEASUREMENTS

Table 4-1 lists voltages and resistances from tube pins to ground. Voltage measurements shown were taken using a test meter having an internal resistance of 20K ohms/volt except as otherwise noted. Good judgment is often required to determine if a particular deviation from the value shown is indicative of trouble.

e. TUBE LOCATIONS

Tubes may be located by reference to call-out photographs, Figures 4-1 and 4-2.

3. SERVICE ADJUSTMENTS

a. GENERAL

Service adjustments may be identified by reference to the call-out photographs, Figures 4-1 and 4-2. Do not touch any service adjustment unless tests clearly indicate the necessity to do so. Such adjustments should not be attempted without complete understanding of the proper procedure.

Before making any adjustments, a five minute warm-up period is required.

b. TEST EQUIPMENT REQUIRED

Description	*Range or Characteristics*
Volt-ohmmeter	20K ohms/volt Test Meter or Vacuum Tube Voltmeter
Cathode-ray Oscillograph	Sweep writing rates: 5 to 5,000 microseconds per inch; 5 mc vertical amplifier
Sine-wave Generator	100 cycles to 1 mc; 5 volts rms

PRECAUTION

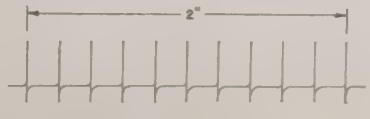
DO NOT SET ANY SERVICE ADJUSTMENTS WITHOUT FOLLOWING SPECIFIC INSTRUCTIONS AND SEQUENCE GIVEN BELOW. MANY ADJUSTMENTS ARE INTERDEPENDENT.

c. PULSE SHAPER CIRCUIT

(1) STAB ADJ (R129—see Figure 4-2)—To check setting, connect the OUTPUT of the calibrator to a cathode-ray oscillograph. Stable output pulses should be observed on the 1 μs through 10K μs steps of the PERIOD switch. If not, adjust R129 to obtain this condition. Check operation of the pulse shaper circuit using an external sine-wave generator connected to the PULSE SHAPER INPUT terminal.

d. DECADE COUNTER CIRCUITS

(1) CHECKING PROCEDURE—To check the necessity for adjusting the blocking oscillator counters proceed as follows: Couple the OUTPUT to a cathode-ray oscillograph. With the PERIOD switch in the 1 μs position, set the oscillograph sweep controls to obtain a ten-interval pulse pattern in two inches of sweep length. See illustration which follows:



(2) 10 μs ADJ (C105—see Figure 4-1)—Check setting by rotating PERIOD switch to the 10 μs position. A one-interval pulse pattern (as follows) should appear in exactly two inches. If not, adjust C105 accordingly.

(3) 100 μs ADJ (R111—see Figure 4-1)—Reset sweep controls to obtain a ten-interval pulse pattern using the 10 μs output. Check setting of R111 by rotating PERIOD switch to 100 μs. A one-interval pulse pattern should appear in exactly two inches. If not, adjust R111 accordingly.

(4) 1K μs ADJ (R115—see Figure 4-1)—Repeat preceding test using 100 μs output to obtain the ten-interval pattern and the 1K μs step for the one-interval pattern. Adjust R115 accordingly.

(5) 10K μs ADJ (R120—see Figure 4-1)—Repeat preceding test using 1K μs output to obtain the ten-interval pattern and the 10K μs step for the one-interval pattern. Adjust R120 accordingly.

e. 0.1 μs PEAKING COIL (L102—located on OUTPUT SELECTOR switch)—Must be adjusted following replacement. Set PERIOD switch in the 0.1 μs position and connect a cathode-ray oscillograph to the OUTPUT terminal. Adjust L102 for maximum output and cement in place.

4. DU MONT "OSCILLOGRAPHER"

The Du Mont "Oscillographer," a periodical, is published by the Allen B. Du Mont Laboratories, Inc., and is sent free of charge to engineers, research workers, and those engaged in the use and application of cathode-ray equipment. When sending in subscriptions or when sending notification of change of address, please supply the following information: name, company name, company address, type of business, and title of individual.

5. DU MONT WARRANTY

All instruments produced by the Instrument Division of Allen B. Du Mont Laboratories, Inc., are sold under the Du Mont Warranty. For the provisions of this warranty, see the Warranty and Service Notice on the inside cover.

6. SERVICE

The Instrument Division maintains complete facilities for servicing Du Mont equipment. For details of the Instrument Service policies, see the Warranty and Service Notice on the inside back cover.

TABLE 4-1

VOLTAGE AND RESISTANCE MEASUREMENTS

Preset front-panel PERIOD switch at PULSE SHAPER position.

TUBE			PIN NUMBERS								
Symbol	Type	Function	1	2	3	4	5	6	7	8	9
V101	12AT7	(A) Crystal Oscillator	150V	–0.6V*	7V	0V	0V	120V	–15V*	0V	6.3 VAC
		(B) 10K μs Counter	50K	10K	1K	0	0	350K	5M	33	1
V102	12AU7	(A) 10 μs Counter	150V	–28V*	0.1V	0V	0V	+150V	0V	+30V	6.3 VAC
		(B) 10 μs Buffer	50K	500K	47	0	0	50K	350K	10K	1
V103	12AU7	(A) 100 μs Buffer	120V	0.1V	7V	6.3 VAC	6.3 VAC	120V	–40V*	0V	0V
		(B) 100 μs Counter	80K	47	10K	0.1	1	80K	600K	47	0
V104	12AU7	(A) 1K μs Buffer	115V	0V	7V	6.3 VAC	6.3 VAC	115V	–27V*	0V	0V
		(B) 1K μs Counter	150K	47	30K	0.1	1	150K	4M	47	0
V105	12AT7	Pulse Generator and Shaper	170V	60V	65V	0V	0V	175V	65V	65V	6.3 VAC
			50K	100K	10K	0	0	50K	30K	10K	0
V106	6AH6	Pulse Output Stage	0V	0V	0V	6.3 VAC	225V	225V	3.8V	...	...
			330K	0	0	0.1	50K	50K	500	...	...
V107	6X4	Rectifier	320 VAC	NC	0V	6.3 VAC	NC	320 VAC	380V	...	...
			300	NC	0	0.1	NC	300	50K	...	...
V108	OA2	+150V Regulator	150V	0V	NC	0V	150V	NC	0V	...	...
			50K	0	NC	0	50K	NC	0	...	...

NOTES: 1. All readings obtained using a 20,000 ohm/volt meter except those indicated by *.

2. * indicates readings taken by VTVM.

3. All voltages dc unless otherwise specified.

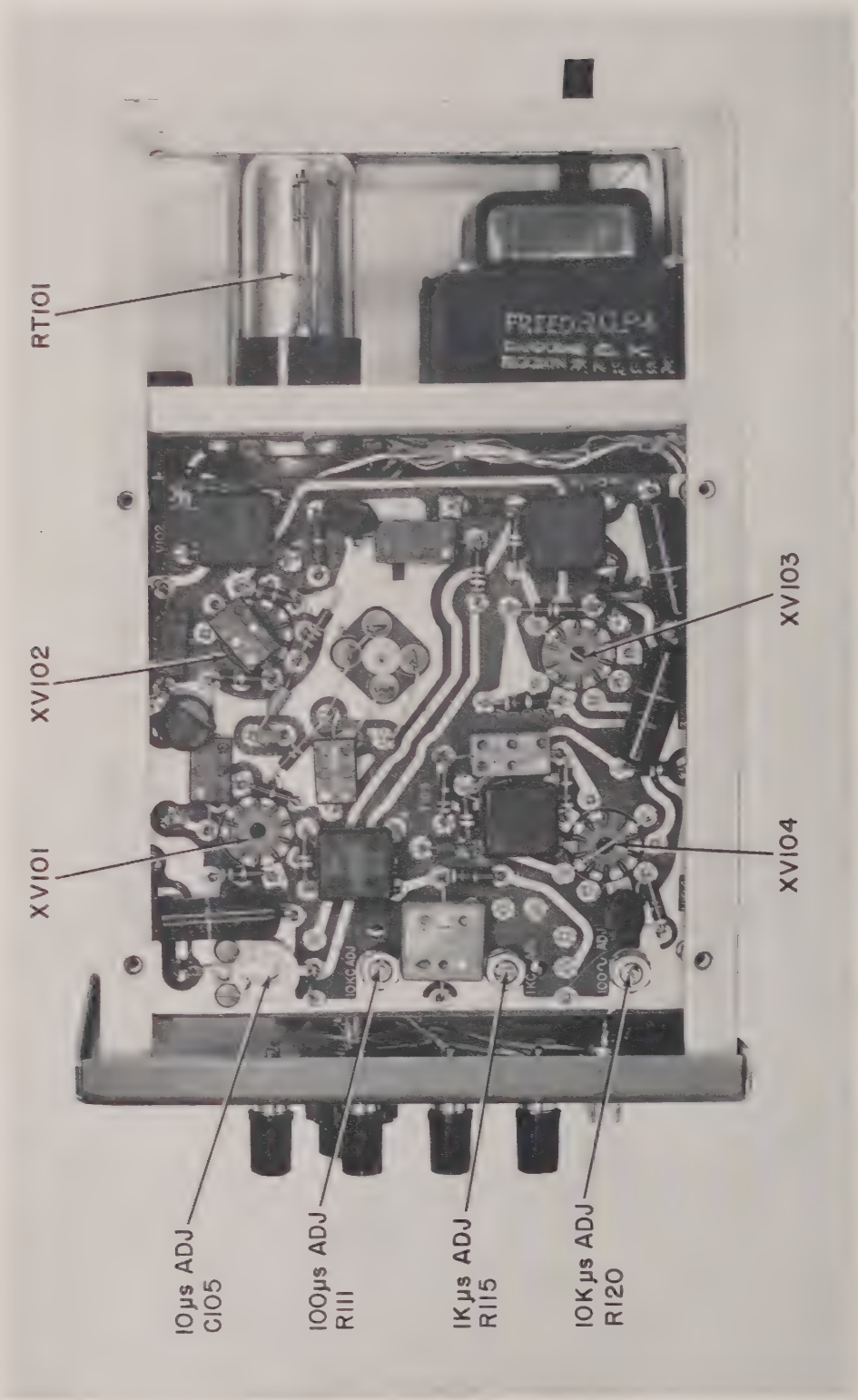


FIGURE 4-1. SERVICE ADJUSTMENTS AND TUBE LOCATIONS, RIGHT SIDE

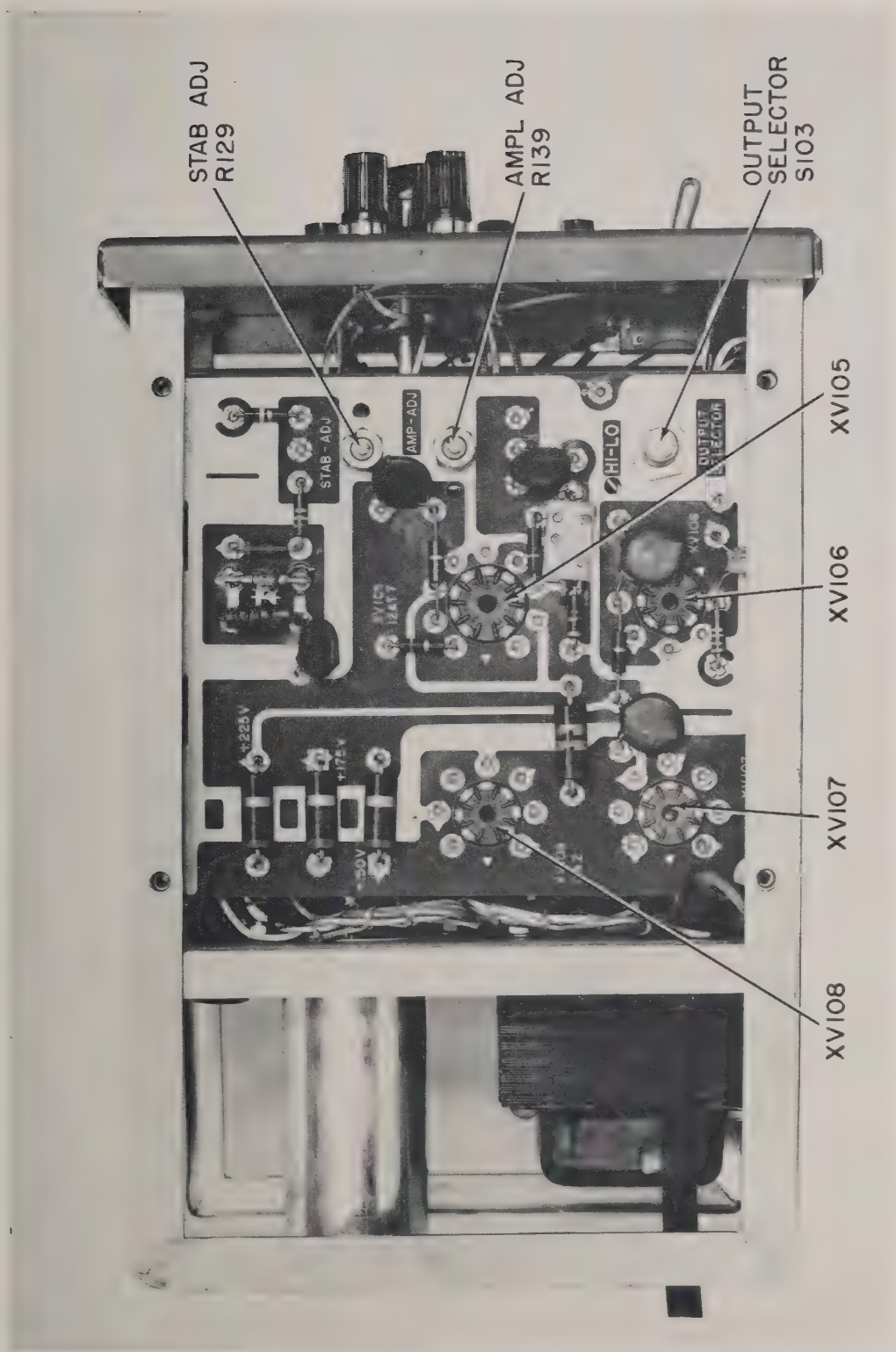


FIGURE 4-2. SERVICE ADJUSTMENTS AND TUBE LOCATIONS, LEFT SIDE

—NOTES—

TYPE 300 TIME CALIBRATOR
COMPONENT PARTS LIST

Symbol	*Part Number*	*Description*
C101	03021210	22 μμf ±5% 500V Mica
C102	03101270	0.001 μf 500V Ceramic
C103	Same as C101	
C104	03014350	3.3 μμf ±20% 500V Composition
C105	03003070	4-30 μμf 500V Variable Ceramic
C106	Same as C101	
C107	03139610	0.02 μf 500V Ceramic
C108	03021290	47 μμf ±5% 500V Mica
C109	03021470	270 μμf ±5% 500V Mica
C110	Same as C107	
C111	03126860	0.1 μf 200V Paper
C112	Same as C107	
C113	03021540	510 μμf ±5% 500V Mica
C114	Same as C111	
C115	03019210	6.8 μμf 500V Ceramic
C116	03034560	5600 μμf ±5% 300V Mica
C117	Same as C111	
C118	03021460	240 μμf ±5% 500V Mica
C119	Same as C107	
C120	03021390	120 μμf ±5% 500V Mica
C121	Same as C102	
C122-C124	Same as C107	
C125A. B. C. D	03014240	20/20/30/30 μf Elect.
C126. C127	Same as C107	

CRYSTALS

CR101	27003300	1 megacycle
CR102	27003310	10 megacycles
CR103	26001530	1N34A

FUSE

F101	11000760	1 Amp.

LAMP

I101	12001310	0.150 Amp. 6.3V Inc.

TERMINALS

J101-J106	51016551	Binding Posts
J107	09029080	Connector. Female Coaxial Type BNC

INDUCTORS

L101	21003810	Fixed. 9.1 Millihenries
L102	21010381	Variable. 0.8-1.2 Microhenries
L103	21002590	Fixed. 47 Microhenries

RESISTORS

R101	02031890	10000 ohms ±10% 1/2 W
R102	02031770	1000 ohms ±10% 1/2 W
R103	02032070	330000 ohms ±10% 1/2 W
R104	02031100	390000 ohms ±5% 1/2 W
R105	Part of S101) 01066400	10000 ohms ±30% 1/4 W. Var.
R106	Same as R101	
R107	02031610	47 ohms ±10% 1/2 W
R108	Same as R102	
R109	Same as R101	
R110	Same as R107	
R111	01060600	1 Meg ±20% Variable
R112	02032080	390000 ohms ±10% 1/2 W
R113	02030830	30000 ohms ±5% 1/2 W
R114	Same as R101	
R115	01060610	2.5 Meg ±20% Variable
R116	Same as R113	
R117	02032190	3.3 Meg ±10% 1/2 W
R118	02032010	100000 ohms ±10% 1/2 W
R119	Same as R101	
R120	Same as R115	
R121	Same as R107	
R122	02032210	4.7 Meg. ±10% 1/2 W
R123	Same as R103	
R124	Same as R101	
R125	02031590	33 ohms ±10% 1/2 W
R126. R127	Same as R102	
R128	02032060	270000 ohms ± 10% 1/2 W
R129	01060580	100000 ohms ±20% Variable
R130	Same as R114	
R131	02031570	22 ohms ±10% 1/2 W
R132	02030600	3300 ohms ±5% 1/2 W
R133	02030890	51000 ohms ±5% 1/2 W
R134	Same as R113	
R135	02036710	9100 ohms ±5% 2 W
R136	Same as R102	
R137	Same as R102	
R138	Same as R103	
R139	01060510	500 ohms ±20% Variable
R140-R142	02037760	820 ohms ±10% 2 W
R143	02113040	3500 ohms ±10% 10 W ww
R144. R145	Same as R102	
R146	Same as R101	

REGULATOR

RT101	02235240	Heater Current Regulator

SWITCHES

S101	05010402	Rotary 7P7T
	05010401	(Switch Assy. Consists of S101 & R105)
S102	05001130	Toggle SPST
S103	05010411	Rotary 3P2T

TRANSFORMER

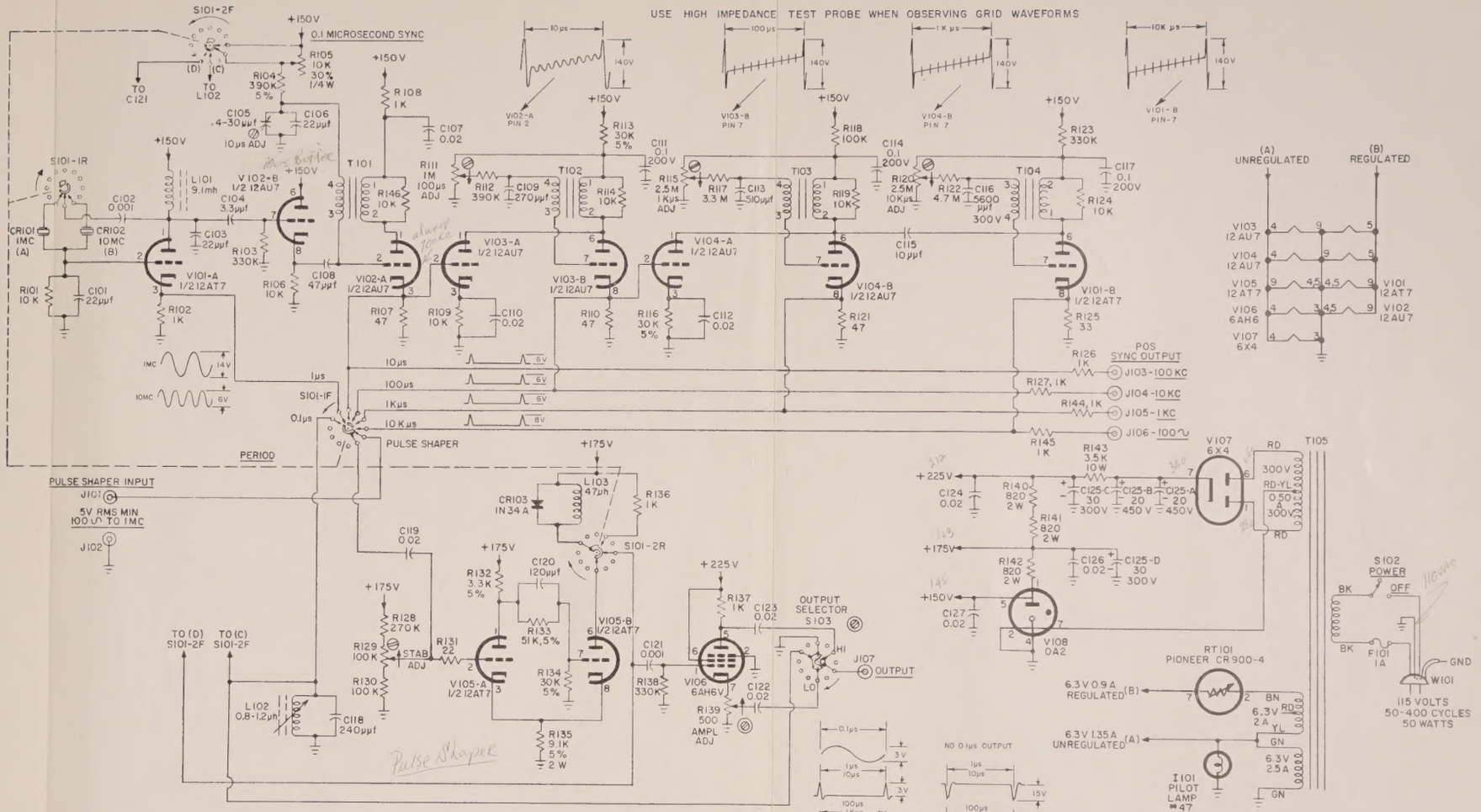
T101-T104	20009580	Pulse
T105	20008110	Power

TUBES

V101	25001330	12AT7
V102-V104	25000130	12AU7
V105	Same as V101	
V106	25002750	6AH6V
V107	25000170	6X4
V108	25000300	OA2

CABLE

W101	50015030	Power



NOTES:

1. FIXED RESISTORS ARE 1/2 W, 10%, UNLESS OTHERWISE SPECIFIED.
2. ALL VARIABLE RESISTORS ARE 1/2 W, 20%. ARROWS DENOTE CLOCKWISE ROTATION.
3. ⊘ DENOTES SERVICE ADJUST; ⊘ DENOTES SIDE PANEL OPERATOR'S ADJUSTMENT.
4. ALL FIXED CAPACITORS ARE 500 VDCW AND VALUES GIVEN IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
5. PERIOD SWITCH SECTIONS ARE SHOWN IN PULSE SHAPER POSITION. OUTPUT SELECTOR SWITCH SHOWN IN HIGH POSITION. ARROWS DENOTE CLOCKWISE ROTATION.
6. UNDERLINED TITLES INDICATE FRONT PANEL LOCATION.

SCHEMATIC DIAGRAM
TYPE 300
ISSUE 1

WARRANTY AND SERVICE NOTICE
for
Industrial Type Cathode-ray Tubes and Instruments

DU MONT INSTRUMENTS

Each instrument manufactured by the Instrument Division of Allen B. Du Mont Laboratories, Inc., is guaranteed to equal or exceed its published performance specifications. It is further guaranteed against defective materials (other than the cathode-ray tube) and workmanship for a period of one year from date of delivery. Any defective instrument or an instrument that does not meet or exceed our specifications will, upon inspection by us, be repaired or replaced at our discretion should such defect appear within the guarantee period.

To register this guarantee, the enclosed guarantee card must be properly filled out and mailed to the factory immediately upon receipt of the equipment. Complete information is necessary. BOTH THE TYPE NUMBER AND THE SERIAL NUMBER OF THE INSTRUMENT MUST BE GIVEN ON THIS CARD.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

DU MONT CATHODE-RAY TUBES

Industrial type cathode-ray tubes manufactured by Allen B. Du Mont Laboratories, Inc., are guaranteed for 1000 hours of operation or for a six-month period of installation, whichever shall first expire. The right is reserved, however, to limit claims to a period of nine months after shipment from the factory. Adjustments will be made on the merit of each individual claim because of the widely varying applications to which such tubes are subjected, and a tube which becomes defective during the guarantee period will be replaced ONLY AFTER INSPECTION AT THE FACTORY. Cathode-ray tubes which are sent in under the guarantee, must be sent with transportation paid.

BURNED OUT HEATERS AND BROKEN GLASS ARE NOT COVERED BY THE TUBE GUARANTEE

To register a tube guarantee, the guarantee card enclosed with the tube must be properly filled out and mailed to the factory immediately upon receipt of the equipment. Complete information is necessary. TYPE NUMBER AND SERIAL NUMBER OF THE CATHODE-RAY TUBE MUST BE INCLUDED. The serial number of the tube will be found either on the glass stem of the electro-gun structure or on the bulb near the Du Mont brand. Tubes must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time and to furnish merchandise in accordance with current specifications without incurring any liability to modify equipment previously sold, or to supply new equipment in accordance with earlier specifications excepting under the classification of special apparatus.

SERVICE

In order to insure factory service under our guarantees, the guarantee cards enclosed with all instruments and tubes must be properly filled out and returned. In all cases where service or adjustment is requested, please write first to the factory giving complete information concerning the nature of the failure and describing the manner in which the equipment was used when failure occurred. THE TYPE NUMBER AND SERIAL NUMBER of the equipment must also be given. In this way, much time can be saved and unnecessary inconvenience often avoided. When writing in this respect, address:

Allen B. Du Mont Laboratories, Inc.
Instrument Service Department
760 Bloomfield Avenue, Clifton, New Jersey

The Instrument Service Department will then send to the customer, the written procedure for sending the instrument back to the factory. All equipment should be packed and shipped in accordance with this procedure; and identification tags should be attached to each tube or instrument.

REPLACEMENT PARTS

If it is necessary to order a replacement component from the factory, always give the type number and serial number of the instrument and refer to the component by its symbol designation and description on the circuit schematic. This will help to expedite service.

DU MONT

Additional copies of this manual may be secured at a cost of one dollar each or ten dollars per dozen copies; postpaid in the United States of America only.

Allen B. Du Mont Laboratories, Inc.

Instrument Division

760 BLOOMFIELD AVENUE, CLIFTON, NEW JERSEY